The laptop : design or desire?

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The Laptop – Design or Desire?

Synopsis

The laptop computer has largely managed to retain its initial status as a marker of executive sensibilities – an electronic briefcase of cutting-edge technology. The first true laptop was the 'Compass' computer by GRiD Systems, which has been presented as a result of the convergence of technologies - a product that was 'ready to happen'. This rhetoric of determinism [in this context, 'design'] is, at odds with the long history of attempts to produce a portable computer [the desire]. This paper aims to use the case study of the laptop computer to highlight the tension between the discourses of technological determinism and the social construction of technology.

Desire

While recently exploring the material culture of the computer and constructing a history of its design[1], it became clear that for various reasons it was necessary to limit the scope of that particular study to that of the office computer only. Not only was the history of the design of portable computers a field in itself, but as cultural objects the messages they contained were vastly different. The office computer began life as a serious piece of scientific equipment that was appropriated for business use. In this role it took on two distinct forms – one as a tool of production (the means of entering, storing and manipulating large amounts of data) and one as a tool of control (managerial, strategic and financial planning). The semiology of these disparate objects and their representation could not have been more marked. One was presented as little more than an electronic typewriter operated by lowly female typists, the other as a combined computing and communication device on the desks of male managers with all the associated status they could muster. With the passage of time, and the removal of sexual stereotyping in the workplace, office computers have converged, become ubiquitous, non-gendered and status free to the extent that they have little in the way of any meaningful semiology, and we are left with a series of bland and boring beige boxes.[2]

Portable computing, however, has always been associated with the higher end of the corporate echelons – an explicit display of status achieved by showing the need to use all available time for work-related activities; the need to be able to access and transmit data while away from the office to support important decision-making processes; the freedom and trust bestowed on the executive to work outside the supervised environment of the office.

The identity of 'the man in the suitcase' – carrying his office with him (and until the early 1980s it always was a 'him') was a recurring theme of any corporate adverts and catalogues promoting portable computing. Status can be conveyed in many ways[3], and although inexpensive, and easily available, the mere act of carrying a briefcase can carry associations of authority and importance, even though there is no real economic value to one which works to give it a symbolic value, just the power of tradition or 'role setting'. The 'James Bond' connotations of briefcases filled with electronic gadgetry must have been highly appealing to many executives. These people are so important they don't go to work in a car – they aspire instead to travel by private plane and helicopter [Figs 1, 2].

For the purposes of this research, the definition of portable computing is an important one, especially with regard to the claim in creating the 'first' laptop computer. The term 'portable computer' is taken here to describe a device which is easily carried while travelling, has its own source of power, a means of storing suitable amounts of data, a full alphanumeric keyboard for typing input, and a screen suitable for displaying a reasonable amount of text. The term laptop defines a similar specification, with the added dimension of size, being able to be supported comfortably and easily on a seated person's lap.

Portable Data Terminals

In truth, early attempts at portable computers were no more than dumb terminals having no computing power of their own, which could be connected to a telephone by an acoustic coupler and transmit sales figures and orders for travelling sales executives [Fig 3]. Although these units could send written messages (just as email today) it was actually illegal to do so, as the Post, Telephone and Telegraph Administration (PTT) had a monopoly on plain language data transmission. The lack of any suitable display technology and the need for 'hard copy' information meant that the technical drive behind these items was printing capability. Silent thermal

printers built into the terminals became a high priority, and ousted noisy mechanical teletype printers.

Two of the many players in this field were the American company 'Texas Instruments' with their 'Silent 700' range of 1972, and the British company 'Transdata' founded in 1970 by John Neale. Transdata's '305' model, although promoted as 'The Executive Terminal', was actually bought by other markets at this point. Neale states "With hindsight, it was not company executives who were interested in portable computing, they had little knowledge or experience of computing. It was the protective enclave of the data processing department. An interesting customer for these terminals, because they required no PTT modem and could be outlocated as demand required, were the programmers at ICL on maternity leave, since they could be easily located in employees homes economically. All other sales came from the Computer Time Sharing companies."[4] Portable Data Terminals remained the only form of portable computing for the next five years.

Portable Memory Terminals

With the development of reasonably priced, durable memory devices a significant step forward in portable computing was made. The Texas Instruments '765 Portable Memory Terminal' of 1977 was aimed directly at the travelling salesman, and included 20K of solid-state bubble memory to enable editing of around four pages of stored data before transmission over the telephone [Fig 4]. Truly portable computing – with more memory and display screens instead of only hard copy output - was still a few years away.

Transportable Computers

'Adam Osborne – He Made the Computer Portable' is a chapter in *Portraits in Silicon*, in which Robert Slater describes the development of "the first commercially successful portable computer".[5] Osborne formed his computer company in 1980, stating "I wanted to make something people could really use. I knew that people would be very happy to move a computer from one desk to another without getting a hernia, or without having pieces falling all over the place, having to unplug everything and plug it up again."[6]

Osborne's specifications for the computer included it being small and sturdy enough for travel, easy to make, and cheap. The result, first shipped in June 1981, was

certainly all those things, but the fact that it was relatively small didn't mean it was light [Fig 5]: "Early portable computers were brutes: typical of them was the Osborne 1, a 13kg machine [in] a box the size of a small suitcase".[7] Others described it as being "as portable as a suitcase full of bricks"[8] and Osborne himself estimated "that at least 80% of its portables never left the office"[9]. According to Slater, critics thought it looked like "a World War II field radio, with all its dials and wires in the front. Yet it was a computer: it had a detachable keyboard, a 5-inch screen, 64K of memory, and two built-in disk drives. And one could take it from home to office - and back home again!"[10]

It was a hugely successful machine: Osborne became "one of the fastest growing companies in the short history of Silicon Valley"[11] earning up to 100 million dollars a year and selling over 100,000 computers, before folding just as quickly in 1983.

Although not the first attempt to put a computer in a suitcase (Xerox, for one, had done the same thing earlier), Osborne was the leader in a field of products largely following his exact format – a heavy computer inside a deep vertical case with a removable lid containing a keyboard. Compaq, DOT, Fox, Hyperion, IBM, ITCS, Jonos, Kaypro, Miracle, Philips, Scorpion, Televideo, Zita, Zorba and other companies all produced similar mains powered products, and the Osborne 1 was perceived at the time as "the archetypal transportable"[12] and represented the accepted form of serious portable computing. Even when the Osborne 1 became obsolete because of its dated operating system, the same form continued with the marginally smaller and lighter IBM-compatible Compaq.

Although some of these computers (including the Osborne) were later available with optional battery packs, a suitable source of battery power remained the stumbling block for portable computers.

Battery Powered Portables

The problem of discussing 'firsts' in historical terms is fraught with difficulty, especially when the object is a complex one consisting of a number of components, and which is subject to a number of incremental developmental changes. Judging from the number of different computers that have been hailed as 'the first laptop' (particularly by their creators[13]) the accolade of designing this particular first would seem to be an important one.

When battery driven computers did appear in the early 1980s they were small and light, but had more in common with large hand-held calculators than with 'real' computers. They typically had very small amounts of memory, and small two or three-line LCD displays – hardly suitable for typing in large amounts of information. In fact, by 1983 two of the front runners in this class (the Tandy 100 [Also stated as "World's 'first' laptop"[14]] and the Olivetti M-10) were seen as striking due to being able to display eight lines of 40 characters and having 8K of Random Access Memory.[15]

Taking these examples as "the latest step forward"[16] the technical innovations embodied in the contemporary 'Compass' computer by GRiD Systems seem all the more impressive.

Design

The 'Compass' computer [Fig 6], designed in 1980, was the first true laptop by the definition used in this paper. This development was presented in the design discourse of the day as result of the convergence of technological developments in the fields of flat displays, rechargeable batteries, and computing memory; creating a product that was "ready to happen"[17].

The GRiD 'Compass' computer was the brainchild of John Ellenby, a British computer scientist who lectured at Edinburgh University and worked as a consultant to Ferranti Ltd on the Argus 700 computer before joining Xerox-PARC in California . Here, he worked on the ALTO computer (the precursor to the Apple Macintosh) and the laserprinter before setting up his own computer development company, GRiD Systems. While looking for a variety of people to create a product development team, he came across Bill Moggridge who had just decided to start a second office of his successful design consultancy in America. It was John Ellenby's suggestion to put this office in Silicon Valley because of the huge opportunities, and so Moggridge started I.D. Two there in 1979. At the end of the same year Ellenby asked Moggridge to help with the industrial design and mechanical engineering of a new product. "The GRiD 'Compass' was the product of a very good integrated team from many backgrounds... GRiD Manufacturing [under Paul Hammel and Larry Gravelle had extremely strong influence on the shape and structure of the product... Bill Moggridge led the visualization and the Industrial Design. Steve Hobson worked very closely with Bill as the lead mechanical designer also Mike Nuttal worked closely with Bill on the ID".[18]

In order to raise the venture capital, Moggridge produced a conceptual model "based on a discussion that John Ellenby and [Moggridge] had about what a laptop computer could be like, and the collection of the technologies that were converging to make it possible".[19] This unit [Fig 7] folded in half across the centre in a geometry similar to that of today's laptops. A small keyboard next to an off-centre display was to be used for telephone dialling. The appearance of a green and blue main keyboard was seen as too radical by the rest of the GRiD team, so later designs used "a more conventional looking keyboard, all black and keys which were a more normal shape rather than the Bellini–like style".[20]

When serious development started "the real restraints of power supplies, printed circuit boards and component availability started to alter the form".[21] This is where technological determinism comes into play – Moggridge states "...why was the laptop ready to happen? Why did John Ellenby come up with this concept? I think that it is mostly to do with the convergence of technologies. It would take a man of his vision to understand the possibility, but if you look at the reason it was possible to happen then rather than some other time, it was because all these different technologies were coming together".[22]

The most important of these technologies in terms of the appearance of the product was the display. The choice was made of a prototype electro-luminescent display by Sharp – a pixel matrix display that could cope with graphics as well as text. "Nobody could really use it and John went straight to Sharp and made a deal with them".[23] Sharp would get an exclusive right for all GRiD products to have their display in, but he would get the exclusive rights for the use of the display for the first year. A visit by Mr. Okano of Sharp Corporation led to an investment by them of 25 million dollars, and a production line was built to manufacture the display specifically for GRiD Systems.

The next technology exploited in design terms was the low-profile keyboard, which suddenly reduced in depth to only ¾" instead of nearly double that. A slim casing became a realistic possibility.

In purely technical terms the latest developments in computer chip design were exploited, as was the novel use of 'bubble' memory, which was light, compact, stable and had come onto the market in the last few years. The GRiD had 256K of bubble

memory “because nobody would ever want more than that”.[24] (Which may seem ridiculous now, but then Japanese portables that followed the GRiD a number of years later were sold with only 32K as standard).

This use of memory ties in with another technological paradigm called ‘GRiD Central’. Moggridge explained “The concept of 256K being adequate was dependent on the fact that you would have information resident on a centralised server. So you would dial in [using the built in modem] to upload or download the files that you wanted to store or retrieve”.[25]

Power for the portable unit was a big issue, as the display consumed 80 watts and batteries to support such power consumption for any length of time were not available. The initial product had a very heavy battery pack option worn on a belt, which lasted for around ¾ hour, and so while battery operated it remained largely a mains driven device.

Finally, the choice of material for the casing as magnesium involved a lot of technological development. The case material was required to be light, robust, and to conduct large amounts of heat away from the power supply. In the overall scheme of the project, price wasn’t too much of an issue, but weight was. Moggridge discovered magnesium being used in chainsaw casings that also had to be light and yet incredibly strong, but which cosmetically were not precise enough for such a product as an expensive computer. Moggridge’s team’s work with a St. Louis chainsaw casing manufacturer in developing precise, thin-wall castings enabled magnesium to become the “metal of choice for a lot of portable electronic equipment”[26].

John Ellenby had a maintenance strategy for the ‘Compass’ computer based around a fairly new phenomenon called ‘Federal Express’, which became an important constraint on the design of the whole computer. He planned to achieve a one-day turnaround and guaranteed that if a problem occurred with a GRiD computer it could be sent it to GRiD by Federal Express that day and it would be fixed and sent back overnight to arrive the next day. This provided a sense of product support to the customer that was new at the time.

To assess the implications of designing the computer for Federal Express shipping requirements, Moggridge hired an impact recorder and sent it by Federal Express and other shippers across the United States and back again to see what happened.

The recorder showed lengthy quiet periods interspersed with 20g's or more of shock when loaded and unloaded by hand onto aeroplanes and trucks. Then it went through Federal Express' automatic sorting machines and was subjected to up to 60g – the equivalent of dropping the computer onto a concrete floor from a height of four feet. 60g became the design spec for shock resistance. The end result could be seen as over-engineering: "In terms of impact [a production 'Compass'] was able to withstand 135g's".[27]

Moggridge states that although rugged, "the design was aimed at trying to make sure it was very prestigious and elegant with the executive in mind."[28] In his view, Ellenby was aiming at executives because the world-wide market was large, they had sophisticated information processing requirements, and weren't too price sensitive (at 8,000 dollars, The GRiD was more than double the cost of an equivalent desktop machine). Although aware that in the view of the venture capitalists, "managers at the time did not use computers"[29], Ellenby was convinced that the market was there, only latent. He had to "create the demand by taking the equipment out to show to people".[30]

However, when the product was launched GRiD's marketing people were disappointed about the small number of people who took it up. "The price was so high, and it was too early for it to be generally acceptable. So it became very much a niche thing".[31] They sold a number to executives from the 'Fortune 500' companies, but not enough to repay the venture capitalists, and so started to look for other niche markets. The design specification of surviving the impact tests meant the unit was very attractive to the military for use in the field, and a large number of specifically adapted computers were sold to the American forces. It's robustness also attracted the attention of NASA, and GRiD computers were screwed to the bulkheads in space shuttles where the graphical display showed astronauts where they were in relation to the ground when in orbit. A number were also purchased for use on the president's 'Airforce One' aeroplanes.

The GRiD's iconic status achieved through such exposure has been reinforced by MoMA, who placed it in their permanent design collection; *Business Week*, who dubbed it "the 'Porsche' of computers"[32]; and by the American Industrial Design Society, who in 1982 gave the GRiD 'Compass' computer the only award for Design Excellence issued that year (as opposed to the normal 60 or so awards they usually bestow) for "substantially advancing the state of the art of computer design".[33]

When the ‘Compass’ was devised, there was a need for a specialised operating system that could run a number of different software applications with a large amount of shared code to keep the memory usage down. When it became clear that the IBM PC was making MS-DOS the industry standard, GRiD made the ‘Compass’ IBM-compatible as soon as possible. “Bill Gates liked the product so much that he agreed to write a special version of MS-DOS specifically for it”[34]. With this determination, and by taking possible future technological developments into account, such as larger screens and flatter keyboards [Fig 8], the ‘Compass’ computer, with only minimal design changes, was in production for over 10 years – unprecedented in modern computing equipment. When Ellenby sold GRiD Systems in 1989, Tandy – who at the time were the world’s largest manufacturers of Personal Computers, bought the company.

Conclusions

The laptop computer John Ellenby uses today “has the same form, is the same size, and has the same aesthetics”[35] as the ‘Compass’. The durability of this designed form for portable computing, and the rapid demise of the ‘luggable’ computer pay testament to the ‘Compass’ as an important and successful piece of design in setting a precedent for the visual identity of the laptop. In both technological and aesthetic terms, the ‘Osborne 1’ and the ‘Compass’, although designed in the same year, are a world apart, and represent two very different approaches to solving the same problem. The Osborne 1 was basically a repackaging exercise: “[It] was a portable approximation of the desktop computer of its day. It had the same CPU, bus, and operating system, and ran the same software as its desktop counterpart”.[36] Ian Stobies’ interview with Adam Osborne highlighted that: “Osborne is not putting his trust in technical innovation”.[37] In contrast, the GRiD team’s more conceptual approach paid dividends: “The chance to work for a new company on a completely new product was tremendously exciting… Here was a blank sheet of paper to work on, instead of the usual one already covered with product precedents, manufacturing equipment and distribution channels”.[38] The visual precedent the ‘Compass’ set was far-reaching - the jurors of the 30th Annual ID Design Review, assessing the development and expansion of the GRiD Systems products, wrote “I.D. Two was upheld for establishing generic stereotypes across a wide range of equipment”[39], and commented on the domination of the ‘black-box’ aesthetic across this category of products.

The vision of John Ellenby, who had realised the potential of flat-display technology for portable computing as early as 1973 while working on early plasma screens, brought together the very latest developments in the work of a large team of diverse specialists in flat panel displays, non-volatile data storage, miniaturised modems and multi-tasking operating system software; which, while cutting-edge, had nevertheless all been previously imagined. John's success in uniting these disparate advances resulted in a product which was "about four years ahead of its time – too advanced for many people".

However, the pre-history of the laptop shows a continual stream of developments in which the concept of the laptop's capabilities, if not the actual form, were a clear aim for many. There was a distinct desire for computing technology at a very personal level, even if the exact nature of its use was confused. Alan Kay's 'Learning Research Group' at Xerox-PARC saw the ALTO as a step towards the 'dynabook', a powerful portable computer in the form of "a personal dynamic medium the size of a notebook which can be owned by everyone and has the power to handle virtually all of its owners information-related needs".[40] Kay envisaged these owners as including "children form age 5 or 6 and 'non computer adults' such as secretaries, librarians, architects, musicians, housewives, doctors and so on".[41] John Ellenby imagined a different user. In 1976 he spoke to one of the managers who had received the ALTO computer on which he had worked. "He told me the ALTO was great, but that he had stopped depending on it as he couldn't take it with him to where problems needed solving. I said I could make one the size of a suitcase – he said 'no – make it half the size of my briefcase!' That's where the aim for the size of the GRiD computer came from".[42] "He gave me the belief that there was indeed demand for a powerful, really portable computer".[43]

Consequently, it is fair to say that if the GRiD 'Compass' computer had not been designed in 1980 it would have arrived eventually, although not necessarily in the same form. Ellenby believes "we would have had 'luggables' for [another four years]"[44], but Kay's vision of the 'Dynabook' predicted the exploitation of technological advances in miniaturisation with some accuracy.

As this case study shows, a single perspective on design history can be problematic, and two very different histories could be written from the perspective of technological determinism, and from the perspective of the social construction of technology. More

fruitful conclusions may be drawn from acknowledging the inevitable overlap between these two discourses of 'Design' and 'Desire'.

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Fig 1 Transdata 'Executive' Terminal, 1975

Fig 2 Texas instruments 'Silent 700' 1972

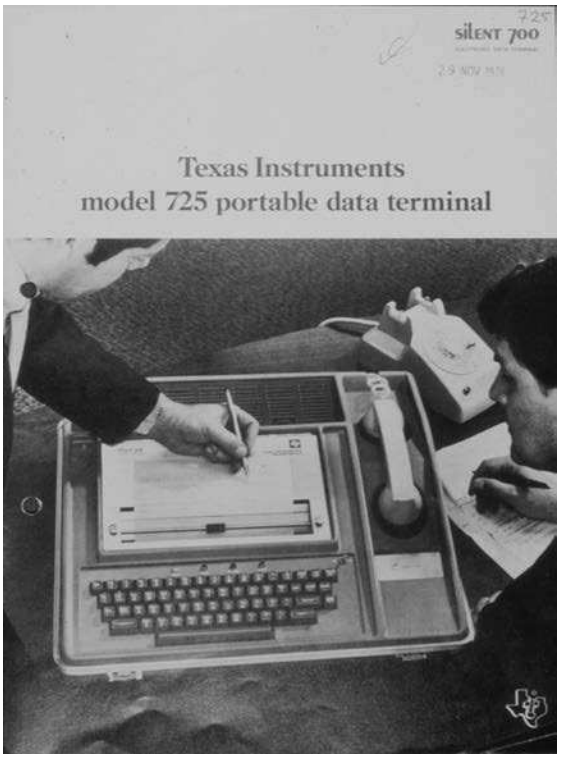

Fig 3 Texas Instruments ‘Model 725’, 1972

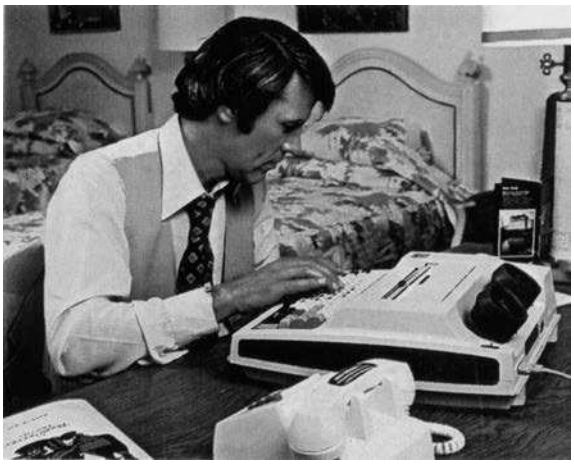

Fig 4 Texas Instruments Model 765, 1977

Fig 5 Osborne 1, 1981

Fig 6 GriD Laptop, 1981

Fig 7 GriD Initial concept model, 1980

Fig 8 Grid Mark II, 1983